

CIVIL AERONAUTICS MANUAL 1

U. S. Department of Commerce

Civil Aeronautics Administration

Civil Aeronautics Manuals and supplements thereto are issued by the Office of Aviation Safety, Civil Aeronautics Administration, for the guidance of the public and are published in the Federal Register and the Code of Federal Regulations.

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SUBJECT: Revisions to Civil Aeronautics Manual 1 dated October 1952

This supplement is issued to provide subscribers of CAM 1 with changes made necessary by recent CAR amendments and the following new material:

CAA policies and rules which apply to CAM 1.15 relative to inspections and tests; CAA policies and interpretations which apply to CAM 1.34, 1.36, 1.37, and 1.38 relative to quality control; and CAA policies which apply to CAM 1.109 relative to identification marking of aircraft for export.

Remove and destroy the following pages:

iii through vi (Table of Contents)

3 and 4

9 through 14

31

Insert in lieu thereof the following pages:

iii through vi

3 through 4-2

9 through 14

31

53 (additional page)

Ink revisions: Change footnote numbers as follows:

Page 5—footnote 2 should be renumbered 5; page 6—footnote 3 should be renumbered 6; page 15—footnote 7 should be renumbered 9; page 16—footnote 8 should be renumbered 10; page 18—footnote 9 should be renumbered 11; page 19—footnote 9 should be renumbered 12; page 19—footnote 10 should be renumbered 13; page 20—footnote 11 should be renumbered 14; page 23—footnote 12 should be renumbered 15; page 24—footnote 13 should be renumbered 16; and page 28—footnote 14 should be renumbered 17.

NOTE: New or revised material indicated by brackets [].

Attachments.

Table of Contents

Applicability and Definitions

	Paragraph	Page
Applicability of this part.....	1.0.....	1
Definitions.....	1.1.....	1
Type design.....	1.2.....	2

Type Certificates

Application.....	1.10.....	2
Application for type certificate (<i>CAA rules which apply to sec. 1.10</i>).....	1.10-1.....	2
Products for which issued.....	1.11.....	2
Appliances (<i>CAA policies which apply to sec. 1.11</i>).....	1.11-1.....	2
Requirements for issuance.....	1.12.....	2
Requirements for issuance of type certificates (<i>CAA policies which apply to sec. 1.12</i>).....	1.12-1.....	3
Location of manufacturing facilities.....	1.13.....	3
Transferability.....	1.14.....	3
Transferability (<i>CAA interpretations which apply to sec. 1.14</i>).....	1.14-1.....	3
Inspections and tests.....	1.15.....	3
Inspections and tests (<i>CAA policies which apply to sec. 1.15</i>).....	1.15-1.....	3
Inspection approval of products, parts, and assemblies (<i>CAA policies which apply to sec. 1.15</i>).....	1.15-2.....	4
Production test flight authorization (<i>CAA policies which apply to sec. 1.15</i>).....	1.15-3.....	4
Logging of production aircraft flight test time (<i>CAA policies which apply to sec. 1.15</i>).....	1.15-4.....	4-1
Production inspection system (<i>CAA rules which apply to sec. 1.15 (d)</i>).....	1.15-5.....	4-1
Surveillance of production inspection system (<i>CAA policies which apply to sec. 1.15 (d)</i>).....	1.15-6.....	4-2
Duration.....	1.16.....	4-2
Display.....	1.17.....	4-2
Privileges.....	1.18.....	4-2
Statement of Conformity.....	1.19.....	
Statement of Conformity (<i>CAA rules which apply to sec. 1.19</i>).....	1.19-1.....	5

Changes in Type Design

General.....	1.20.....	5
Changes in type design (<i>CAA policies which apply to sec. 1.20</i>).....	1.20-1.....	5
Classification of changes.....	1.21.....	5
Approval of minor changes.....	1.22.....	5
Approval of major changes.....	1.23.....	5
Service experience changes.....	1.24.....	5

Production Certificates

Application.....	1.30.....	6
Production certificate (<i>CAA interpretations which apply to sec. 1.30</i>).....	1.30-1.....	6
Submitting application (<i>CAA rules which apply to sec. 1.30</i>).....	1.30-2.....	6
Processing application (<i>CAA policies which apply to sec. 1.30</i>).....	1.30-3.....	6
Products for which issued.....	1.31.....	6
Requirements for issuance.....	1.32.....	6
Issuance of a production certificate (<i>CAA policies which apply to sec. 1.32</i>).....	1.32-1.....	6
Production certification requirements (<i>CAA policies which apply to sec. 1.32</i>).....	1.32-2.....	6

CONTENTS

CIVIL AERONAUTICS MANUAL 1

	Paragraph	Page
Location of manufacturing facilities.....	1.33.....	7
Location of manufacturing facilities (CAA policies which apply to sec. 1.33).....	1.33-1.....	7
Quality control.....	1.34.....	7
Quality control (CAA policies which apply to sec. 1.34).....	1.34-1.....	7
Statement of conformity.....	1.35.....	13
Statement of conformity (CAA policies which apply to sec. 1.35).....	1.35-1.....	13
[Quality control data requirements; prime manufacturer.....	1.36.....	13
[Quality control data requirements; prime manufacturer (CAA policies which apply to sec. 1.36).....	1.36-1.....	13
[Information on subsidiary manufacturers.....	1.37.....	13
[Information on inspection system-subsidiary manufacturers (CAA policies which apply to sec. 1.37).....	1.37-1.....	13
[Changes in quality control system.....	1.38.....	14
[Changes in quality control system (CAA interpretations which apply to sec. 1.38).....	1.38-1.....	14
Multiple products.....	1.39.....	14
Multiple products (CAA policies which apply to sec. 1.39).....	1.39-1.....	14
Production limitation record.....	1.40.....	15
Production limitation record (CAA policies which apply to sec. 1.40).....	1.40-1.....	15
Modification of the production limitation record.....	1.41.....	15
Modifying a production limitation record (CAA policies which apply to sec. 1.41).....	1.41-1.....	15
Transferability.....	1.42.....	16
Transferability (CAA policies which apply to sec. 1.42).....	1.42-1.....	16
Inspection.....	1.43.....	17
Inspection by CAA representative (CAA policies which apply to sec. 1.43).....	1.43-1.....	17
Duration.....	1.44.....	17
Duration (CAA policies which apply to sec. 1.44).....	1.44-1.....	17
Display.....	1.45.....	17
Display (CAA policies which apply to sec. 1.45).....	1.45-1.....	17

Aircraft and Product Identification

Identification.....	1.50.....	18
Identification (CAA policies which apply to sec. 1.50).....	1.50-1.....	18

Airworthiness Certificates

Application.....	1.60.....	18
"Registered owner" (CAA interpretations which apply to sec. 1.60).....	1.60-1.....	18
Application form (CAA rules which apply to sec. 1.60).....	1.60-2.....	18
Processing application (CAA policies which apply to sec. 1.60).....	1.60-3.....	18
Airworthiness certificates (CAA policies which apply to sec. 1.60).....	1.60-4.....	19
Aircraft categories for which airworthiness certificates are issued.....	1.61.....	19
Airworthiness certificate classifications (CAA policies which apply to sec. 1.61).....	1.61-1.....	19
Amendment or modification.....	1.62.....	19
Changing airworthiness classification (CAA policies which apply to sec. 1.62).....	1.62-1.....	20
Transferability.....	1.63.....	20
Duration.....	1.64.....	20
Duration of airworthiness certificate (CAA policies which apply to sec. 1.64).....	1.64-1.....	20
Display.....	1.65.....	21
Display of airworthiness certificate (CAA rules which apply to sec. 1.65).....	1.65-1.....	21
Airworthiness certificates for normal, utility, acrobatic, and transport categories.....	1.66.....	21
Airworthiness certificate; requirements for issuance.....	1.67.....	21
Airworthiness certificates for restricted category aircraft.....	1.68.....	21
Airworthiness certificates for restricted category aircraft; requirements for issuance.....	1.69.....	21
Issuance of restricted airworthiness certificates (CAA policies which apply to sec. 1.69).....	1.69-1.....	22
Multiple airworthiness certification.....	1.70.....	22
Issuance of multiple airworthiness certificates (CAA policies which apply to sec. 1.70).....	1.70-1.....	22

	Paragraph	Page
Airworthiness certificate for limited category aircraft.....	1.71.....	22
Issuance of limited airworthiness certificates (<i>CAA policies which apply to sec. 1.71</i>).....	1.71-1.....	22
Airworthiness certificate for limited category aircraft; requirements for issuance.....	1.72.....	23
Procedure to be followed for recertification in the "Limited Category" (<i>CAA policies which apply to sec. 1.72</i>).....	1.72-1.....	24
Experimental certificates.....	1.73.....	24
Experimental airworthiness certification (<i>CAA policies which apply to sec. 1.73</i>).....	1.73-1.....	24
Experimental certificates; requirements for issuance.....	1.74.....	24
Requirements for the issuance of experimental airworthiness certificates (<i>CAA rules which apply to sec. 1.74 (a)</i>).....	1.74-1.....	24
Additional information (<i>CAA policies which apply to sec. 1.74 (a)</i>).....	1.74-2.....	25
Certification of amateur-built aircraft (<i>CAA policies which apply to sec. 1.74</i>).....	1.74-3.....	25
Special flight permits.....	1.75.....	27
Special flight permits (<i>CAA interpretations which apply to sec. 1.75</i>).....	1.75-1.....	27
Special flight permits; requirements for issuance.....	1.76.....	27
Application for permit (<i>CAA rules which apply to sec. 1.76</i>).....	1.76-1.....	27
Airworthiness (<i>CAA policies which apply to sec. 1.76</i>).....	1.76-2.....	28
Flight restrictions (<i>CAA policies which apply to sec. 1.76</i>).....	1.76-3.....	28

Aircraft Nationality and Registration Marks

General.....	1.100.....	28
Display of identification marks.....	1.101.....	28
Assignment of registration numbers (<i>CAA policies which apply to sec. 1.101 (a)</i>).....	1.101-1.....	29
Location of identification marks.....	1.102.....	29
Measurements of identification marks.....	1.103.....	30
Color.....	1.104.....	30
Affixation.....	1.105.....	30
Design.....	1.106.....	30
Maintenance.....	1.107.....	30
Identification marks for nonconventional aircraft.....	1.108.....	30
Identification marks for nonconventional aircraft (<i>CAA rules which apply to sec. 1.108</i>).....	1.108-1.....	30
Identification marks for export aircraft.....	1.109.....	31
Identification marks for export aircraft (<i>CAA policies which apply to sec. 1.109</i>).....	1.109-1.....	31

List of Figures

<i>Figure</i>	<i>Page</i>
1. ACA-312, Application for Type Certificate.....	33
2. ACA-335, Propeller Supplement to Application for Type Certificate ACA-312.....	34
3. ACA-331, Type Certificate.....	35
4. Reverse of ACA-331.....	36
5. ACA-317, Statement of Conformity.....	37
6. Reverse of ACA-317.....	38
7. ACA-332, Application for Production Certificate.....	39
8. ACA-313, Manufacturing Inspection Authorization.....	40
9. ACA-314, Manufacturing Inspection Report.....	41
10. Reverse of ACA-314.....	42
11. ACA-333, Production Certificate.....	43
12. ACA-333a, Production Limitation Record.....	44
13. ACA-305, Application for Airworthiness Certificate and/or Annual Inspection of an Aircraft.....	45
14. ACA-305a, Aircraft Inspection Report.....	46
15. ACA-1362, Certificate of Airworthiness.....	47
16. ACA-186, Approval Tag.....	47
17. ACA-1779, Application and Authorization for Ferry Permit.....	48
18. ACA-309, Operation Limitations.....	49
19. Regional Boundaries and Location of Regional Offices.....	51

Appendix

【Appendix A.—Table of Aircraft Nationality Markings】.....	<i>Page</i> 53
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tions, the Administrator finds that the type design meets the requirements of the applicable Civil Air Regulations."

1.12-1 REQUIREMENTS FOR ISSUANCE OF TYPE CERTIFICATES. (*CAA policies which apply to sec. 1.12.*)

(a) The requirements for the issuance of a type certificate for an aircraft may be found in the following parts of the Civil Air Regulations:

- (1) PART 3. Airplane Airworthiness Normal, Utility, and Acrobatic Categories.
- (2) PART 4a. Airplane Airworthiness. NOTE.—Applies to new airplanes for which application for type certificate was received prior to the effective dates prescribed in Part 3, dated November 1, 1949, and Part 4b, dated October 1, 1949.
- (3) PART 4b. Airplane Airworthiness Transport Categories.
- (4) PART 5. Glider Airworthiness.
- (5) PART 6. Rotorcraft Airworthiness.
- (6) PART 8. Aircraft Airworthiness Restricted Category.
- (7) PART 9. Aircraft Airworthiness Limited Category.
- (8) PART 13. Aircraft Engine Airworthiness.
- (9) PART 14. Aircraft Propeller Airworthiness.
- (10) PART 16. Aircraft Radio Equipment Airworthiness.

"CAR 1.13 Location of manufacturing facilities. No type certificate for a product shall be issued if the manufacturing facilities therefor are located outside the United States, unless where facilities are located outside the United States the Administrator finds that no undue burden on the Government is created in administering applicable requirements of the act or regulations issued thereunder."

"CAR 1.14 Transferability. A type certificate may be transferred or made available to third persons by licensing agreements, and the grantor shall immediately notify the Administrator in writing of any transfer, licensing agreement, or termination thereof. The provisions of § 1.13 shall be complied with."

1.14-1 TRANSFERABILITY. (*CAA interpretations which apply to sec. 1.14.*)

The CAA and the manufacturer to whom the type certificate is issued are the first and second persons involved, and any other person to whom the type certificate holder may transfer privileges incidental to the type certificate is the "third person."

["1.15 INSPECTIONS AND TESTS.

["(a) A representative of the Administrator shall be permitted to make such inspections and, in the case of aircraft, flight tests as may be necessary to determine compliance with applicable requirements.

["(b) A product manufactured under a type certificate only shall be required to undergo inspection by a representative of the Administrator to determine whether individual products conform with the type design.

["(c) The manufacturer of a product being manufactured under a type certificate only shall maintain at the place of manufacture such technical data and drawings as may be necessary to determine whether the product or any part thereof conforms to the current type design.

["(d) A manufacturer producing a product under the terms of a type certificate without a related production certificate shall provide, for products manufactured after six months from the date of issuance of the type certificate, a production inspection system approved by the Administrator which will give assurance that each article produced is in conformity with the type design and is in a condition for safe operation."

["1.15-1 INSPECTIONS AND TESTS. (*CAA policies which apply to sec. 1.15.*)

["(a) Parts, assemblies or products fabricated by the prime, subsidiary or sub-divisional manufacturer operating under the terms of a type certificate only will be inspected while the articles are in an "inspectable" condition. Drawings and other technical data maintained at the place of manufacture should be made available by the manufacturer to enable the CAA Aviation Safety Agent to determine that the finished product or any part thereof conforms with the applicable requirements and current type design data.

1.15(b)

[(b) Aircraft manufactured under a type certificate only will be flight tested at the manufacturer's plant by, or under the supervision of, a CAA Aviation Safety Agent prior to airworthiness certification. Upon completion of the flight test, the aircraft may be shipped unassembled provided that:

[(1) The aircraft is inspected for conformity and airworthiness by a CAA Aviation Safety Agent at the manufacturer's plant, and

[(2) Approval Tags, Form ACA-186, are attached to all major assemblies, components, and boxes of parts. These tags will be signed by the CAA Aviation Safety Agent, and will indicate the make, model, and serial number of the aircraft.

[(c) After completion of the engine test run (see sec. 1.15-5 (e)), each engine will be subjected to such internal inspections and examinations by a CAA Aviation Safety Agent as may be necessary to ascertain that no unsafe condition exists.

[(d) All propellers will be subjected to such inspections and examinations by a CAA Aviation Safety Agent to ascertain conformity with the type design data, and to assure that no unsafe condition exists. (See sec. 1.15-5 (f) for tests required for variable pitch propellers.)

1.15-2 INSPECTION APPROVAL OF PRODUCTS, PARTS, AND ASSEMBLIES. *(CAA policies which apply to sec. 1.15.)*

[(a) *Complete products.* When products other than complete aircraft or communications equipment are manufactured under the terms of a type certificate only, the CAA Aviation Safety Agent, having determined by inspection that the product is acceptable, will prepare and attach thereto, by means of a lead seal, an Approval Tag, Form ACA-186. This tag will show the make and model of the product tagged, will indicate that the product has been inspected and approved, and will be signed by the CAA Aviation Safety Agent.

[(b) MAJOR COMPONENTS.

[(1) Any major spare or replacement components of an aircraft, aircraft engine, propeller, or appliance manufactured under a type certificate only will be inspected for conformity and airworthiness by a CAA Aviation Safety Agent. All such major assemblies or compo-

CIVIL AERONAUTICS MANUAL 1

nents, upon determination of acceptability, will be tagged with an Approval Tag, Form ACA-186, which will identify the part to which attached, will indicate the make and model of the aircraft, engine, propeller, etc., for which intended, and will bear the CAA Aviation Safety Agent's signature.

[(2) The conformity, quality, and acceptability of major components and critical parts manufactured by a subsidiary manufacturer in accordance with the prime manufacturer's approved drawings will be determined in accordance with section 1.34-1 (a) (2), except that an agent of the CAA will conduct such additional inspections as may be deemed necessary to determine conformity, compliance, and acceptability of materials and workmanship.

1.15-3 PRODUCTION TEST FLIGHT AUTHORIZATION. *(CAA policies which apply to sec. 1.15).*

[(a) To facilitate compliance by manufacturers with related provisions of section 43.10, the reverse side of the Dealer's Aircraft Registration Certificate, Form ACA-1707, will be used to provide flight authorization for production flight testing prior to the initial issuance of individual airworthiness certificates.² This flight authorization is provided for the convenience of manufacturers, and has no connection with the issuance, validity, or continuation of the Dealer's Aircraft Registration Certificate. The flight authorization is limited to production test flights, and does not provide for prototype or experimental flight testing. The flight authorization will be issued at the time the Dealer's Aircraft Registration Certificate is issued. The Application for Dealer's Aircraft Registration Certificate(s), Form ACA-1706, contains a section for the use of manufacturers in applying for authorization to conduct production flight tests.

[(b) Aircraft to be flown for production flight tests, which are intended for U. S. regis-

² A new aircraft, in which a Manufacturer's Special Flight Authorization, Form ACA-1707, is displayed, may be given a production flight test subject to the following operations limitations which are specified on such form:

Flights, except takeoffs and landings, prohibited over thickly populated areas or large gatherings of people. No flight shall be conducted for hire or reward. Cross-country flights prohibited. Occupancy of the aircraft restricted to personnel essential to the purpose of the flights.

tration and certification, are required to display the appropriate U. S. identification markings in accordance with sections 1.100 through 1.108.

[(c) New aircraft intended for export should display the appropriate foreign identification markings during the production flight testing.³ If these markings are not available, the aircraft may display temporarily assigned U. S. identification markings.

1.15-4 LOGGING OF PRODUCTION AIRCRAFT FLIGHT TEST TIME. (*CAA policies which apply to sec. 1.15*). Production flight test time will be recorded on the flight test check-off form.⁴

1.15-5 PRODUCTION INSPECTION SYSTEM. (*CAA rules which apply to sec. 1.15 (d)*).

[(a) Within the first six months from the date of issuance of the type certificate, the manufacturer producing products under the terms of a type certificate only, shall establish and thereafter maintain, a production inspection system which will insure conformity with the type design data, and that unacceptable materials and parts are not installed in the finished product. Statistical quality control procedures may be employed where it is shown that a satisfactory level of quality will be maintained for the particular materials or parts involved.

[(b) The production inspection system shall include materials review procedures and a Materials Review Board to process parts and materials rejected because of damage or manufacturing errors, which may be serviceable, when such rejected items are to be considered for installation in the product. (See sec. 1.34-1 (e) for procedures.) The Materials Review

[³ A new aircraft which, upon completion of local production flight tests, is to be disassembled and shipped to a foreign purchaser, or a new aircraft for which foreign nationality and registration markings have been requested but not received, may be locally test-flown by the manufacturer without displaying identification markings. In such case, the CAA agent will place the following additional operations limitations on the Manufacturer's Special Flight Authorization, Form ACA-1707:

Flights will be restricted to vicinity of manufacturer's plant. Local authorities responsible for the enforcement of flight regulations will be advised of such flights.

[⁴ Such flight test time need not be made a part of the aircraft or aircraft engine logbooks. Any flight test time, including accelerated service flight testing of prototype or modified aircraft, after airworthiness certification, must be recorded in accordance with section 43.23.

Board shall consist at least of representatives from the inspection and engineering departments. Parts and materials which are determined by the Materials Review Board to be serviceable shall be properly identified and reinspected if rework or repair is necessary. Parts or materials rejected by the Materials Review Board, or by inspection, shall be marked accordingly and disposed of in a manner which will prevent such parts and materials being incorporated in the finished product.

[(c) Inspection records shall be maintained, identified with the completed product where possible, and retained in the manufacturer's files for at least two years. Complete records of Materials Review Board action applying to materials, parts, assemblies, and the completed product, shall be retained for at least two years and available for review by the Aviation Safety Agent.

[(d) COMPLETE AIRCRAFT.

[(1) After the prototype is type certificated, each aircraft produced under the terms of a type certificate only shall be flight tested by the manufacturer as a final check on the operation of the completed product. The manufacturer shall develop a production flight test procedure and a flight check-off form, subject to approval of CAA, to be used in connection with the initial flight testing of each production aircraft. The flight test procedure shall apply to aircraft which are assembled and delivered via flyaway, and to those which are delivered unassembled to an authorized distributor.

[(2) The production flight test shall provide for at least the following:

[(i) An operational check of the trim, controllability, or other flight characteristics, to establish the fact that the production aircraft has the same range and degree of control as the prototype aircraft.

[(ii) An operational check of each part or system operated by the crew while in flight to establish that, during flight, all instrument readings are within normal range.

[(iii) A determination that all instruments are properly marked, and that all placards and/or required Flight Manuals are installed after flight test.

[(iv) A check of the operational characteristics of the aircraft on the ground.

1.15-5(d) (2) (v)

[(v) A check on any other items peculiar to the aircraft being tested which can best be done during the ground or flight operation of the aircraft.

[(e) **COMPLETE ENGINES.** Each engine (either reciprocating or turbine) produced under the terms of a type certificate only, shall be subjected to a satisfactory test run by the manufacturer, consisting of break-in runs which shall include a determination of fuel and oil consumption and maximum power characteristics. The test run shall include at least 5 hours of operation at the maximum rating, of which at least thirty minutes shall be at take-off power and speed where this rating is in excess of the maximum continuous rating. This test may be conducted with the engine mounted on a torque stand or on a fixed stand with a calibrated test club or propeller. For rocket type engines, a satisfactory sampling technique means of testing shall be established. Each engine tested shall be subject to the inspection provided for in section 1.15-1 (c).

[(f) **COMPLETE PROPELLERS.** Each variable pitch propeller produced under the terms of a type certificate only, shall be subjected to a satisfactory functional test to determine that the propeller will operate properly throughout the normal pitch range, as a final check on its operational characteristics. Each propeller tested shall be subject to the inspection provided for in section 1.15-1 (d).

1.15-6 SURVEILLANCE OF PRODUCTION INSPECTION SYSTEM. (*CAA policies which apply to sec. 1.15 (d).*)

[(a) During the six months' interval, the CAA will conduct conformity inspections to determine that the finished product is in conformity with the type design data, is airworthy, safe for installation on a certificated aircraft, or, in the case of aircraft, is eligible for an airworthiness certificate.

[(b) Materials review dispositions will be spot checked by a representative of the Administrator to verify that no obvious adverse effect will result from such dispositions.

[(c) At the end of the six month interval,

CIVIL AERONAUTICS MANUAL 1

the CAA will advise the manufacturer whether the inspection system is considered acceptable. If the inspection system is considered acceptable, as determined by evaluating the results of the system as reflected in the conformity, quality, and airworthiness of the finished products, the CAA will thereafter reduce its inspection surveillance and increase its reliance in the manufacturer's inspection system in the determination of the airworthiness of future products. If the inspection system is not acceptable, as evidenced by questionable parts and materials accepted for installation in the finished product, or significant discrepancies repeatedly found in the finished products, the issuance of airworthiness certificates for aircraft or approvals of other products for installation on an aircraft may be deferred until the manufacturer has made necessary corrective changes.]

"CAR 1.16 Duration. A type certificate shall remain in effect until surrendered, suspended, revoked, or a termination date is otherwise established by the Board.

"CAR 1.17 Display. Type certificates shall be made available for examination by an authorized representative of the Board or of the Administrator.

"CAR 1.18 Privileges. The holder of a type certificate or license may produce duplicates of any product for which a type certificate has been issued.

"CAR 1.19 Statement of Conformity. (a) The holder of a type certificate only or of a current right to the benefits of a type certificate only under a licensing arrangement, upon the initial transfer by him of the ownership of any product manufactured under such type certificate or upon application for original issuance of an airworthiness certificate for an aircraft, shall furnish to an authorized representative of the Administrator a statement of conformity for such product on a form prescribed by the Administrator. For aircraft manufactured under a type certificate only, there shall be included a statement that the aircraft referred to has been flight checked. When a production certifi-

imum in determining the acceptability of the manufacturer's quality control system as provided for in section 1.34:

(a) **INSPECTION SYSTEM.** The activities of the aircraft industry are of such number and variety that it is impracticable, within the scope of this manual, to give more than a general outline of the manner in which an approved inspection organization should operate.

(1) **INSPECTION—PRIME MANUFACTURER.** The prime manufacturer's inspection organization should be controlled by a chief inspector who, in turn, should be directly responsible to the management of the firm so that his decisions are not influenced by considerations other than the quality of the work for which he is responsible. It is also essential that the chief inspector control inspection through all departments of the firm. If such an arrangement is not possible by reason of the fact that certain departments are engaged in specialized work, these departments should operate under a separate inspection system. However, their activities should be coordinated under the general supervision of a quality control organization. The same procedure should apply in the case of dispersed or branch facilities of a main organization when inspection activity is divided.

The inspection system should be so organized that parts and materials will receive appropriate inspection while in an "inspectable" condition. *Spot and sampling inspection* systems may be considered as meeting these requirements provided the prime objectives of conformity, airworthiness, and safety are assured.

The inspection department should be provided with tools and equipment necessary to conduct all phases and types of inspection and tests essential to the continued production of duplicate products. Master templates, precision tools, and gauges should be readily available and used by the inspection department. The tools used by the production department in constructing the part, if used by inspection, should be periodically checked to determine that the results obtained are within approved tolerances and that conformity with approved design data is maintained.

Clearly defined areas for inspection of large units on the production floor and cages or booths

for smaller items should be provided in order that the inspectors may operate efficiently and without interference.

Definite procedures should be established for delivering parts to the inspection booths and for removing and storing inspected parts in order that installation of uninspected parts will be prevented.

After the manufacturer's facilities are approved for a production certificate, detailed inspection by the CAA of each part or component during fabrication will not normally be necessary. Continuation of this procedure will depend upon the extent to which the manufacturer maintains the adequacy of such facilities and the conformity and quality of the article produced.

Civil Aeronautics Administration personnel will spot-check to determine whether individuals in the inspection departments are capable and fulfill their duties in an efficient manner.

(2) **INSPECTION—SUBSIDIARY MANUFACTURER.** The following is in reference to major components, assemblies, or critical parts which are fabricated by a subsidiary manufacturer in accordance with the prime manufacturer's (type certificate holder's) approved drawings. This relates only to those components and parts which are delivered to the prime manufacturer for installation on or in the type certificated product. It will be necessary that the prime manufacturer or his authorized representative conduct such inspections and investigations as may be necessary to determine the acceptability of such parts before they are presented to the CAA for inspection in the final configuration. Acceptability, as referred to above, includes determination of compliance with related regulations and standards, conformity with approved design data forming the basis for type certification of the finished product, and the general acceptability and airworthiness of materials and workmanship incorporated in these products, as provided for in section 1.15 with respect to products manufactured under a type certificate only, or as provided herein with respect to products manufactured under a type and production certificate. If these major components, assemblies, or critical parts are of such a nature that they cannot be properly inspected for determination of ac-

ceptability when received at the prime manufacturer's facilities, it will be the responsibility of the prime manufacturer to arrange for the performance of such inspections at the subsidiary manufacturer's plant as may be necessary to make these determinations. Examples of the assemblies, components, and parts referred to above include covered wings, covered control surfaces, rotary gear box assemblies, landing gear assemblies, and other critical parts, the malfunctioning or failure of which might adversely affect the operational characteristics or safety of the aircraft. The prime manufacturer holds basic responsibility for the conformity, airworthiness, and acceptability of the finished product, and, in accordance with section 1.19, will be required to submit a statement of conformity with respect to each product manufactured under a type certificate only which is to be presented for CAA approval in the case of engines, propellers, etc., or certification in the case of an aircraft. The prime manufacturer should arrange with the subsidiary manufacturers to permit CAA inspection at the subsidiary manufacturers' plants on request from authorized aviation safety agents.

(b) INSPECTION RECORDS. Inspection records should be maintained which are complete and present an historical compilation of all events during the course of manufacture. Smaller parts, which are inspected in quantities, should be segregated, tagged, stamped, or otherwise marked after having been inspected.

It is recommended that continuous records of all parts be maintained which indicate the name, drawing number, number of pieces inspected, and the number accepted and rejected.

At final assembly, the inspection forms for the components of the completed unit should be identified with the complete unit, so that they may be traced at a later date if it becomes necessary to place responsibility for inspection of various components or to determine that all components have been inspected.

Company production inspection forms and records should be retained in the files of the manufacturer for at least one year subsequent to the date of sale and delivery of the product involved. Under such a system, individual inspection responsibility may be established at a later date.

(c) INSPECTOR'S IDENTIFICATION. All parts inspected and approved should be permanently marked when practicable to identify the individual inspector responsible.

(d) INSPECTORS REQUIRED. The number of inspectors required to perform the necessary inspection will vary with the complexity of the product and of processes involved. It will also vary between departments and with labor conditions. Under any circumstances there should be sufficient inspection personnel to adequately check all processes and products to the extent necessary to provide reasonable assurance of conformity, quality, and acceptability of the finished product. Spot and sampling inspection systems may be considered as meeting these requirements provided the prime objective of conformity, airworthiness, and safety is assured. Inspection personnel should be vested with sufficient authority to permit them to perform their assigned duties in a manner which will warrant the issuance or continuation of a production certificate, provided other requirements are complied with.

[(e) MATERIALS REVIEW. Manufacturers' drawings prescribe certain tolerances which permit minor variations. When these tolerances are exceeded, the parts or materials involved are subject to rejection by personnel responsible for conformity, and may subsequently be referred to a Materials Review Board for examination, analysis, and final disposition in accordance with an approved materials review procedure. The Quality Control Department should be responsible for the effective operation of the Materials Review Board.¹ The CAA factory agent will spot check materials review dispositions, as necessary, to verify that products produced under the terms of the production certificate will consistently meet a satisfactory level of quality and conformity.

[(1) The established materials review procedures should provide that:

[¹ The effective operation of the Materials Review Board should materially minimize discrepancies and errors which may otherwise become chronic, and, furthermore, may serve as a yardstick by means of which the adequacy and acceptability of the production and quality control systems may be evaluated. However, the materials review system should not be used primarily, or in place of the inspection or quality control system, to determine acceptability of parts and materials.

[(i) All materials, parts, and components which are damaged or do not conform to approved type design and/or other approved standards will be rejected and isolated.

[(ii) All items thus withheld will be reviewed by qualified quality control and engineering personnel (Materials Review Board) to determine whether such items may be used safely in their present condition, whether rework or repair is necessary to assure equivalent safety and reliability, or whether the items are to be scrapped.

[(iii) All items which are reworked or repaired in accordance with materials review dispositions will be reinspected for conformity therewith.

[(iv) All items accepted through materials review action will be identified by stamp, tag, etc.

[(v) The Materials Review Board will maintain accurate records which will provide at least the following:

[(a) Name, part number, date, and quantity of parts involved.

[(b) The quantity of parts in the lot or order.

[(c) Description of the discrepancy.

[(d) The material review disposition.

[(e) The results of reinspection.

(Items accepted after inspection will be treated as normal material.)

[(vi) When material is first found by the manufacturer's inspection personnel to depart from the specification and/or drawings, the material shall be properly identified, and may be given a preliminary review by authorized manufacturer's inspection personnel.

[(a) If the material is obviously unfit for use and irreparable, it should be disposed of by the manufacturer in such a way as to preclude installation in the finished product.

[(b) If the material does not meet the requirements because of incomplete fabrication, the manufacturer may provide for the additional work necessary to bring the material within specified requirements without submission to the Materials Review Board.

[(c) The CAA Aviation Safety Agent is authorized to approve certain variations or

repairs made by the manufacturer without submission to the Materials Review Board.

[(d) All questionable materials to be considered for use in the finished product which cannot be disposed of by preliminary review action should be designated for Materials Review Board action.

[(2) The Materials Review Board should use discretion in deciding on the proper disposition of new parts and materials presented for review. This Board should not accept parts with deviations of a nature which make it impossible to readily install the part with a mating part which does conform with the pertinent drawings. Parts or assemblies involving mating parts should be in conformity with drawing tolerances to the extent that such parts may be installed, removed, or replaced without harm, misalignment, or injury to adjoining parts or portions of the finished product. In assembling parts under these circumstances, no fabrication operations such as cutting, hammering, bending, prying, or forcing should be permitted, or, when final installation has been completed, the parts should not be temporarily or permanently subjected to deformation or distortion of a nature which would cause any undesirable tensions, compressions, stresses, or strains. Where deviating parts, in themselves, are found acceptable, they must not jeopardize the airworthiness or performance of other parts when installed in the assembly. In general, parts which do not conform with the approved technical data should not be accepted when such parts can be reworked to conform with the approved design data.

(f) TECHNICAL DATA. A system should be established whereby detailed drawings and other technical data are available to both production and inspection personnel.

[(g) FLIGHT OR FUNCTIONAL TESTS. Each aircraft, aircraft engine, and variable pitch propeller produced under the terms of the production certificate will be subjected to a flight or functional tests as a final check on the operation of the completed product.

[(1) Aircraft produced under a production certificate will be flight tested periodically by the CAA. The number or percentage of aircraft which will be flight tested by the CAA

will be dependent upon the complexity and size of the aircraft, and upon experience gained while conducting functional and reliability tests of prototype and production aircraft prior to issuance of the production certificate. The manufacturer should formulate a flight test schedule that is acceptable to CAA personnel conducting the tests.

[(2) Aircraft may be delivered unassembled to an authorized distributor prior to initial assembly and flight test, provided the manufacturer will acquaint the distributor with his established flight test procedure and furnish him with copies of the approved flight test check-off form. Flight test procedures established by a distributor must be equivalent to those established by the manufacturer, including the use of an identical flight test check-off form. These forms, when prepared by the manufacturer, will be filed as part of the aircraft inspection record, and, when prepared by a distributor, will be retained by him for future reference.

[(3) Each aircraft engine produced under the terms of a production certificate should be subjected to a satisfactory test run consisting of a break-in run, which should include at least the determination of each engine's fuel and oil consumption and maximum power characteristics. This test may be conducted with the engine mounted on a torque stand or on a fixed stand with a calibrated test club or propeller. Sufficient internal examination of each engine should be accomplished to reasonably ascertain that no unsafe conditions exist.

[(4) Each variable pitch propeller produced under the terms of a production certificate should be subjected to a satisfactory functional test to determine that the propeller will operate properly throughout the normal pitch range. All propellers should be inspected for conformity with the type design data and to assure that no unsafe conditions exist.

[(h) **STANDARD EMPTY WEIGHT AND C. G. FOR PRODUCTION AIRCRAFT.** The following procedure may be used by aircraft manufacturers to avoid the necessity of weighing each aircraft. This procedure applies only to newly manufactured air-

craft (except transport category aircraft) which are produced under the terms of a production certificate.

[(1) Manufacturers who are interested in establishing an average empty weight and empty c. g., in lieu of actually weighing each aircraft, should prepare a detailed proposal regarding the procedure to be followed. This material should be furnished to the assigned Aviation Safety Agent for approval. Any proposal which will provide an accurate determination of average empty weight and c. g. will be considered acceptable.

[(2) The following example outlines an acceptable method for effecting this system:

[(i) Actually weigh and determine the empty c. g. of ten aircraft of a particular model, which have identical equipment installed, as a means of establishing an average empty weight and empty c. g.

[(ii) Subsequently, with respect to aircraft of the same model which have identical equipment installed, weigh an individual aircraft at regular intervals; e. g., each tenth aircraft, for the purpose of determining continued accuracy of the initial empty weight and empty c. g. established. If this weighing indicates a variation in empty weight which is in excess of 1 percent of the initially established weight, or a variation in the empty c. g. which exceeds $\frac{1}{2}$ percent of the MAC, a new average weight should be established in accordance with procedures followed in establishing the initial average empty weight and c. g. conditions.

[(3) A weight and balance report is required in connection with each aircraft presented for airworthiness certification. These reports may be computed for aircraft which are not actually weighed, and should be marked "computed." All other reports should be marked "actual."]

"CAR 1.35 Statement of Conformity. It shall not be necessary for the holder of a production certificate to furnish a separate statement of conformity for each of the products produced."

1.35-1 STATEMENT OF CONFORMITY. (CAA policies which apply to sec. 1.35.)

The Statement of Conformity, Form ACA-

317,² also will not be required for a product to be exported, provided the product is produced under the terms of a production certificate.

["1.36 QUALITY CONTROL DATA REQUIREMENTS; PRIME MANUFACTURER. The applicant shall submit for approval by the Administrator, as evidence of his ability to control the quality of any product for which he requests a production certificate, data describing the inspection and test procedures necessary to insure that each article produced is in conformity with the type design and is in a condition for safe operation. The data submitted shall include such of the following as are applicable to the product involved:

["(a) A statement describing assigned responsibilities and delegated authority of the quality control organization, together with a chart indicating the functional relationship of the quality control organization to management and to other organizational components and indicating the chain of authority and responsibility within the quality control organization.

["(b) A description of inspection procedures applying to raw materials, outside purchased items, and parts and assemblies produced by subsidiary manufacturers. The information shall include the methods used to insure acceptable quality of parts and assemblies which cannot be completely inspected for conformity and quality when delivered to the prime manufacturer's plant.

["(c) A description of the methods used for production inspection of individual parts and complete assemblies, including the identification of any special manufacturing processes involved, the description of the means used to control such processes, a description of the final test procedure for the complete product, and, in the case of aircraft, a copy of the manufacturer's production flight test procedure and check-off list.

["(d) An outline of the materials review system, including the procedure for recording review board decisions and disposing of rejected parts.

² The reporting requirements of this form are subject to the approval of the Bureau of the Budget in accordance with the Federal Reports Act of 1942.

["(e) An outline of a system by means of which company inspectors are kept currently informed regarding changes in engineering drawings, specifications, and quality control procedures.

["(f) A list or chart showing location and type of inspection stations."

[1.36-1 QUALITY CONTROL DATA REQUIREMENTS; PRIME MANUFACTURER. (*CAA policies which apply to sec. 1.36*). The quality control data (one copy only) should be submitted in manual form with the Application for a Production Certificate, Form ACA-332, to the local CAA Aviation Safety Agent.

["1.37 INFORMATION ON SUBSIDIARY MANUFACTURERS. The prime manufacturer shall make available information regarding all major inspections accomplished by a subsidiary manufacturer for acceptance of parts or assemblies for which the prime manufacturer is responsible."

[1.37-1 INFORMATION ON INSPECTION SYSTEM—SUBSIDIARY MANUFACTURERS. (*CAA policies which apply to sec. 1.37*). The prime manufacturer should include in the quality control data required by section 1.36 sufficient information to define and explain the means established to assure that all major parts and assemblies are in conformity with the design data when manufactured by a subsidiary manufacturer. The prime manufacturer should notify the CAA that the subsidiary's facilities are ready for inspection. If these facilities and the quality control system are found acceptable, the subsidiary will be granted the same privileges regarding acceptance of items manufactured as though they were produced by the prime manufacturer. Acceptance of a subsidiary manufacturer's quality control system by the CAA does not relieve the prime manufacturer of his responsibility for the over-all conformity and airworthiness of the part or assembly. Prior to CAA approval of a subsidiary manufacturer's quality control system, parts and assemblies should be subjected to a complete inspection for conformity and quality at the prime manufacturer's plant, or arrangements should be made for suitable inspection at the subsidiary manufacturer's

plant by the prime manufacturer's inspection personnel and, as required, by CAA personnel.

["1.38 CHANGES IN QUALITY CONTROL SYSTEM. Subsequent to the issuance of a production certificate, any changes to the quality control system shall be subject to review by the Administrator. The holder of a production certificate shall immediately notify the Administrator in writing of any such changes affecting the data prescribed in section 1.36."

[1.38-1 CHANGES IN QUALITY CONTROL SYSTEM. (*CAA interpretations which apply to sec. 1.38*). The phrase, "any changes to the quality control system," is interpreted to mean changes to a manufacturer's organization, systems, procedures or processes which may affect the inspection, conformity, and airworthiness of the product. Changes which are not consistent with the quality control data submitted in accordance with section

1.36 should be promptly directed to the attention of the CAA by means of revised pages or supplemental information. The CAA will review these changes to determine that the quality, conformity, or airworthiness of the product will not be adversely affected.]

"CAR 1.39 Multiple products. The Administrator may authorize more than one type certificated product to be manufactured under the terms of one production certificate provided that the products have similar production characteristics."

1.39-1 MULTIPLE PRODUCTS. (*CAA policies which apply to sec. 1.39.*)

More than one airplane type may be manufactured under the same production certificate, provided the types of construction and processes are similar. However, two basically different products such as an airplane and helicopter or an airplane and an engine will not be included under one production certificate. Sep-

to prescribe the procedure for displaying identification marks on nonconventional aircraft. For the purpose of prescribing identification marks, an aircraft is considered to be nonconventional when it is impossible to display the identification marks in accordance with the applicable rules prescribed in sections 1.101 through 1.107.

(b) **PROCEDURE.** The owner of the aircraft shall submit to the local CAA representative a dimensioned three view drawing, or dimensioned photographs of the aircraft, including a statement setting forth the reason why it is not possible to identify the aircraft in accordance with the standard requirements. If the owner desires to include a proposed method of marking, it too will be considered. Such proposal shall take into consideration, as near as possible, the standard identification marking procedure set forth in sections 1.101 through 1.107.

This information shall be submitted to the local CAA representative as far in advance of the anticipated flight date as possible, since the CAA representative must forward the information to the Washington office for final decision.

"1.109 Identification marks for export aircraft. An aircraft manufactured in the United States for delivery outside the United States or its possessions may display such identification marks as are required by the State of registry of the aircraft. Such aircraft shall be operated only for the purpose of test and demonstration flights for a limited period of time or while in necessary transit to the purchaser."

[1.109-1 IDENTIFICATION MARKS FOR EXPORT AIRCRAFT. (*CAA policies which apply to sec. 1.109*). When foreign nationality and registration markings are not available for display upon new aircraft to be exported via flyaway to U. S. border or to some

other location in U. S. where the aircraft will be disassembled for shipment, U. S. identification markings may be displayed on the aircraft in the normal manner (provided title to the aircraft is held by a citizen of the U. S.), and the markings may be affixed with a readily removable material.]

(a) To minimize the cost involved in affixing identification markings to new aircraft being exported, exporters (manufacturers, dealers, and distributors who are holders of dealers' aircraft registration certificates) may request a special U. S. identification number consisting of one to three digits, which will be preceded by the letter N when displayed on the aircraft. Only one such number will be issued to each exporter, to be used repetitively in connection with previously unregistered aircraft which are being exported. These numbers will be used only in connection with the flyaway delivery of aircraft which are being exported, and will be displayed only during that portion of the flyaway delivery which takes place over U. S. territory. In the event two or more aircraft displaying the same identification number may be flying in relatively close formation, each aircraft will be identified, insofar as radio contacts are concerned, by combining the identification number displayed with the last two digits of the manufacturer's serial number of the aircraft. For example, an aircraft displaying the identification mark N2M and having manufacturer's serial number 203040 will be identified as N2M40. In order that the pilot may readily determine his radio call number, a placard bearing the call number of the aircraft should be displayed on the windshield or instrument panel in a location readily visible to the pilot. In this example, the placard would read N2M40.¹⁸

¹⁸ See Appendix A of this manual for a table of aircraft nationality markings.

Appendix A

Table of Aircraft Nationality Markings

This table of aircraft nationality markings should not be confused with the list of foreign governments with which the U. S. maintains export relations (contained in Aviation Safety Release No. 390).

Country	Nation- ality marks	Country	Nation- ality marks	Country	Nation- ality marks
Afghanistan.....	YA*	Haiti.....	HH	New Zealand.....	ZK, ZL, ZM
Argentina.....	LV	Honduras.....	XH	Nicaragua.....	AN
Australia.....	VH	Iceland.....	TF	Norway.....	LN
Austria.....	OE	India.....	VT	Pakistan.....	AP
Belgium and Colonies.....	OO	Indonesia.....	PK	Panama.....	HP
Bolivia.....	CP*	Iran.....	EP	Paraguay.....	ZP
Brazil.....	PP, PT	Iraq.....	YI	Peru.....	OB
Burma.....	XY, XZ	Ireland.....	EI, EJ	Philippine Republic.....	PI
Canada.....	CF	Israel.....	4X	Poland.....	SP
Ceylon.....	4R	Italy.....	I	Portugal.....	CS
Chile.....	CC	Japan.....	JA	Portuguese Colonies.....	CR
China (Taipeh Taiwan).....	B	Jordan (Hashemite Kingdom of the Jordan).....	TJ*	Saudi Arabia.....	HZ
Colombia.....	HK	Korea (Republic of).....	HL	Spain.....	EC
Costa Rica.....	TI	Lebanon.....	OD	Sweden.....	SE
Cuba.....	CU*	Liberia.....	EL	Switzerland.....	HB
Czechoslovakia.....	OK	Libya.....	5A	Syria.....	YK
Denmark.....	OY	Luxembourg.....	LX	Thailand (Siam).....	HS
Dominican Republic.....	HI	Mexico.....	XA, XB, XC	Turkey.....	TC
Ecuador.....	HC	Morocco.....	CN	Union of South Africa.....	ZS, ZT, ZU
Egypt.....	SU	Netherlands.....	PH	United Kingdom.....	G
El Salvador.....	YS	Netherlands Antilles.....	PJ	British Colonies and Pro- tectorates.....	VP, VQ, VR
Ethiopia.....	ET	Surinam.....	PZ	United States.....	N
Finland.....	OH	New Guinea.....	JZ	Uruguay.....	CX
France.....	F	Newfoundland.....	VO	Venezuela.....	YV
Greece.....	SX	New Hebrides.....	YJ		
Guatemala.....	TG				

* This marking is not yet officially confirmed.